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(54) AMPLIFIER MEASUREMENT AND MODELING PROCESSES FOR USE IN GENERATING PREDISTORTION PARAMETERS

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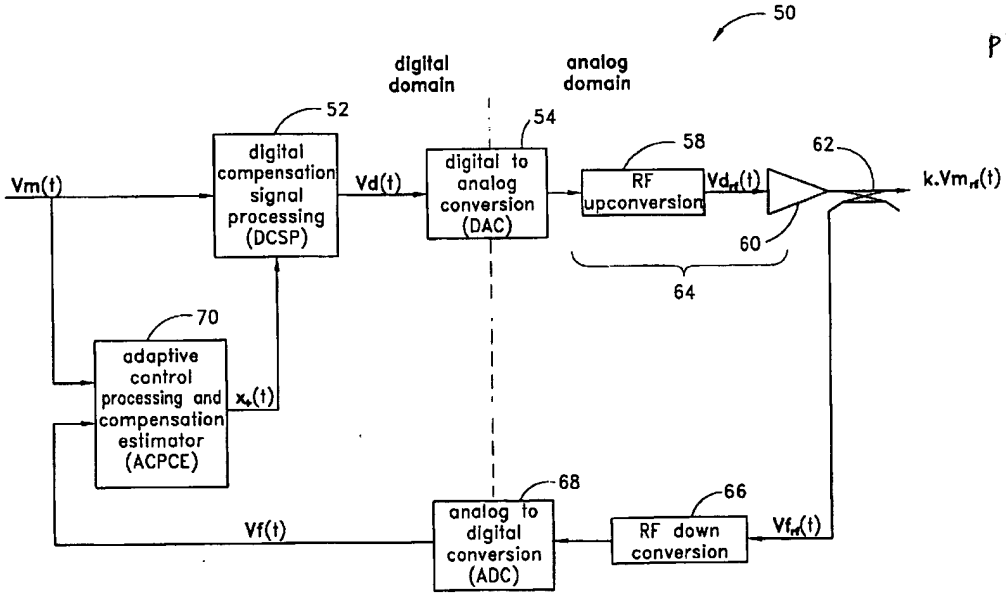
(57) **ABSTRACT**

A wideband predistortion system compensates for a nonlinear amplifier's frequency and time dependent AM-AM and AM-PM distortion characteristics. The system comprises a data structure in which each element stores a set of compensation parameters (preferably including FIR filter coefficients) for predistorting the wideband input transmission signal. The parameter sets are preferably indexed within the data structure according to multiple signal characteristics, such as instantaneous amplitude and integrated signal envelope, each of which corresponds to a respective dimension of the data structure. To predistort the input transmission signal, an addressing circuit digitally generates a set of data structure indices from the input transmission signal, and the indexed set of compensation parameters is loaded into a compensation circuit which digitally predistorts the input transmission signal. This process of loading new compensation parameters into the compensation circuit is preferably repeated every sample instant, so that the predistortion function varies from sample-to-sample. The sets of compensation parameters are generated periodically and written to the data structure by an adaptive processing component that performs a non-real-time analysis of amplifier input and output signals. The adaptive processing component also implements various system identification processes for measuring the characteristics of the power amplifier and generating initial sets of filter coefficients. In an antenna array embodiment, a single adaptive processing component generates the compensation parameters sets for each of multiple amplification chains on a time-shared basis. In an embodiment in which the amplification chain includes multiple nonlinear amplifiers that can be individually controlled (e.g., turned ON and OFF) to conserve power, the data structure separately stores compensation parameter sets for each operating state of the amplification chain.

predistortion



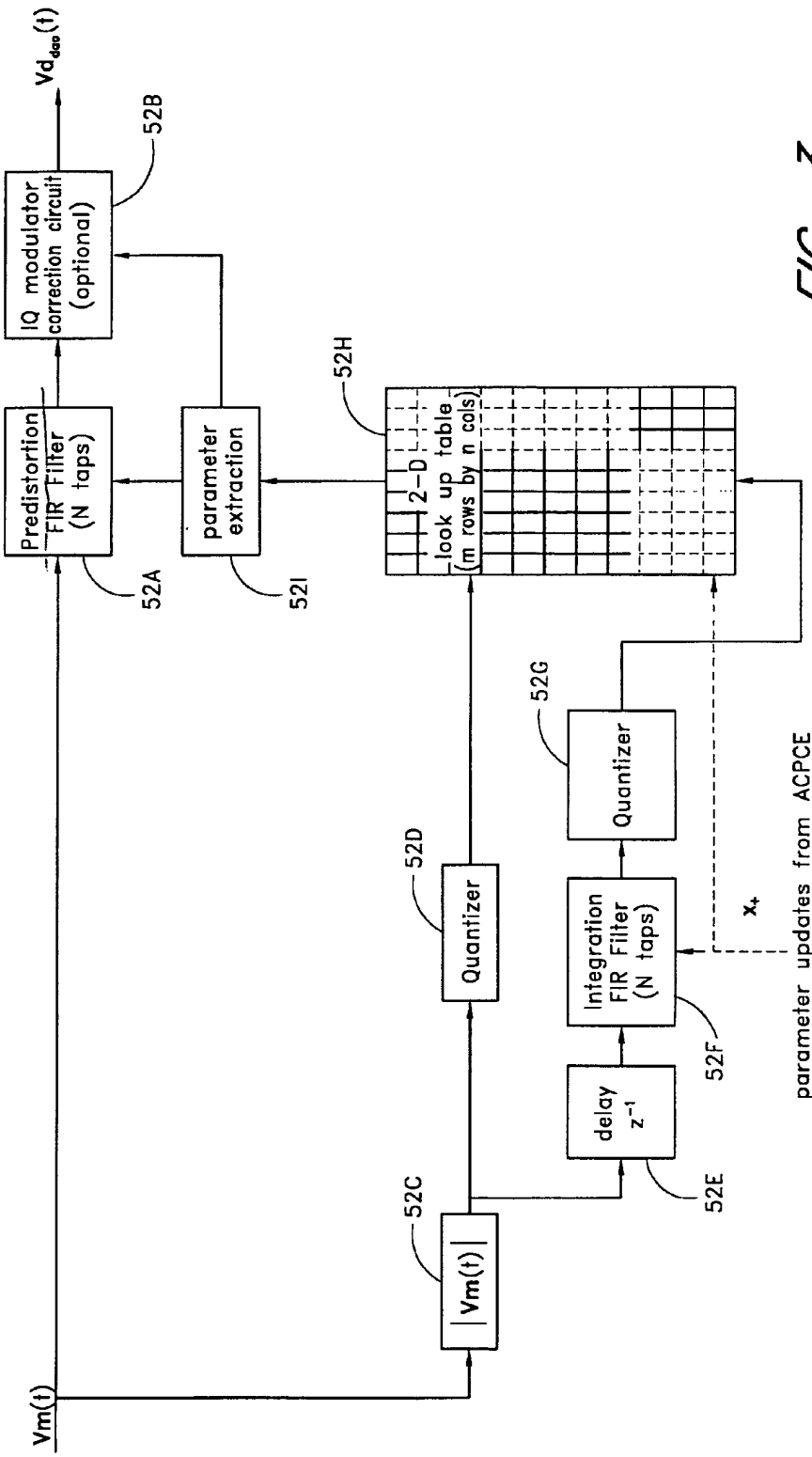

$Vd_{dac}(t)$
52B
IQ modulator correction circuit (optional)
Predistortion FIR Filter (N taps)
52A
parameter extraction
52I
52H
2-D look up table (m rows by n cols)
52G
Quantizer
52D
Quantizer
Integration FIR Filter (N taps)
52F
delay z^{-1}
52E
52C
|Vm(t)|
Vm(t)
x_+
parameter updates from ACPCE

FIG. 3